

# **SPECIFICATION**

**TITLE OF INVENTION:**

PIT CUSHION CAM & ROLLER KIT

**CROSS-REFERENCE TO RELATED APPLICATIONS:**

“Not Applicable”

**STATEMENT REGARDING FEDERALLY SPONSORED**

**RESEARCH OR DEVELOPMENT:**

“Not Applicable”

# REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISK APPENDIX

“Not Applicable”

## BACKGROUND OF INVENTION:

The PIT CUSHION CAM AND ROLLER KIT replaces the current Follower Link Assembly used on all Brunswick Model A-2 pinsetters. The PIT CUSHION CAM AND ROLLER KIT eliminates the moving components of the Follower Link Assembly that are known to have unsatisfactorily wear and failure rates. The PIT CUSHION CAM AND ROLLER KIT's component design allows the pinsetter to operate more efficiently with less moving parts and with less maintenance requirements.

The Follower Link Assembly acts as a pivot assembly to raise the pit cushion upon ball impact so the bowling ball can pass under the pit cushion to enter the ball elevator and to lower the pit cushion at the end of a pinsetter cycle. The pit cushion assembly is suspended across the pit area to stop the forward motion of a bowling ball after the ball passes through the bowling pins and falls into the pit area. The pit cushion is basically a steel plate padded and covered in many different ways so as not to mark or damage bowling balls.

Two kickbacks, one on each side of the bowling lane bed, support and serve as mounts

for the pinsetter. Mounting plates are bolted to the top of the kickbacks. Mounted to the kickback mounting plates are four pit cushion support brackets that suspend the pit cushion above the pit area. Hinged to the two front brackets are two pit cushion support arms. An airplane type shock absorber is hinged to the lower end of this support arm and the top of the shock absorber connects to the rear kickback pit cushion-mounting bracket. The shock absorbers relieve the sudden rearward motion of the pit cushion upon ball impact. Mounted by 3/8 bolts to each side of the pit cushion is a cushion mounting arm. The lower end of the pit cushion mount, located on each side of the pit cushion, contains a pressed bushing to act as a pivot for the pit cushion. Inserted into this bushing is a steel spacer. This spacer exceeds the length of the pressed bushing. The steel spacer acts as a pivot point for the pit cushion through pivot links (a/k/a follower links). The pivot links are attached at each side of the spacer via 1/2 inch bolt which attaches the Follower Link Assembly to the pit cushion mount located on each side of the pit cushion. Pit cushion mount is attached to pit cushion by two 3/8-inch bolts. The Follower Link Assembly (pivot links) controls movement of the pit cushion.

The follower links control the forward positioning of the pit cushion at the end of the pinsetter cycle restricted via design of elongated slots of the follower links (pivot links). Attached to each end of the pit cushion on the same pivot bolt that hinges the follower links to the pit cushion is a uniball that also attaches to a vertical adjustable link. The vertical adjustable links attach to a pair of parallel triangular plates. The triangular plates are pivoted and attached to brackets from the rear legs of the pinsetter frame. A second adjustable pit cushion link runs from the triangular plates to "V" levers on the rake lift shaft at the top of the

pinsetter. The forward end of the left-hand pit cushion link is attached to the adjustable link of the rake trip mechanism that lowers the rake sweep board to the bowling lane. The impact of the bowling ball against the pit cushion causes the pit cushion to rotate clockwise and thus push the vertical links upward. This upward movement rotates the triangular plates clockwise pushing the second adjustable pit cushion link forward thereby rotating the rake trip link rearward allowing the rake trip mechanism to unlatch lowering the rake sweep board to the bowling lane. As the rake lowers, the pit cushion link rotates the triangular plates clockwise and, through the vertical links, raises the pit cushion allowing the bowling ball to pass under the pit cushion to the ball elevator. The slot on the follower links permits the pit cushion to be raised by the upward motion of the vertical links. The counterclockwise rotation of the pit cushion as the rake board raises allows the weight of the pit cushion to pull the vertical links downward, rotate the triangular plates counterclockwise, and move the pit cushion links (pivot links) downward at the end of the pinsetter cycle. The pit cushion again is in position to await delivery of the next bowling ball. It can be seen that the rake sweep board and pit cushion operate together. When the rake sweep board is down, the pit cushion is up. When the rake sweep board is up, the pit cushion is down. During the pinsetter cycle, the pit cushion height is controlled by the elongated slot of the follower links (pivot links) thus allowing passage of the bowling ball to the ball elevator assembly.

The Follower Link Assembly is viewed by Pinsetter Mechanics as an area with a high rate of mechanical failure and maintenance. Due to the severity and repetition of the bowling ball striking the pit cushion, the integrity of follower link assembly has been known to deteriorate at an undesirable rate. The Follower Link Assembly parts are used to control the position of

the pit cushion prior to bowling ball impact making the Follower Link Assembly components susceptible to the severity of bowling ball impact. The two pivot links of the Follower Link Assembly are bolted to a steel spacer inserted into a pressed bushing at the lower end of the pit cushion mount to act as a pivot for the pit cushion. This spacer exceeds the length of the pressed bushing. The pivot point of the pivot links begins to degrade at the point of connection with the steel spacer due to the severity of bowling ball impact and lack of adequate lubrication. The urethane pivot rollers, which are part of the elongated slot of the pivot links, harden over time and cause resistance to the pivot of the Follower Link Assembly and pit cushion. The Follower Link Assembly part deterioration results in continued restricted pit cushion rotation resulting in reduction of vertical link and triangular plate upward rotation upon bowling ball impact responsible for unlatching rake trip mechanism to begin pinsetter cycle. As parts of the Follower Link Assembly continue to deteriorate, component rotation continues to be seriously impeded thus resulting in the need for the Follower Link Assembly replacement to restore the rake trip mechanism performance to satisfactory operable condition. The follower links control the forward positioning of the lower end of the pit cushion. Due to the pit cushion position, bowling balls are susceptible to getting pinned between the pit cushion and ball lift rod assembly that could result in bowling ball damage and the failure to return the bowling ball back to the bowler.

## BRIEF SUMMARY OF THE INVENTION:

Replacing the Follower Link Assembly with the PIT CUSHION CAM AND ROLLER KIT eliminates all the Follower Link Assembly components known to fail due to ball impact and lack of adequate lubrication. Pit cushion positioning, when the pinsetter is waiting for bowling ball impact (0 degrees), is not controlled by the PIT CUSHION CAM AND ROLLER KIT's components and therefore not as susceptible to component deterioration due to the severity and repetition of the bowling ball striking the pit cushion. Also, pit cushion rotation is not controlled by the PIT CUSHION CAM AND ROLLER KIT resulting in less component deterioration. Rotation of the pit cushion is unimpeded until pit cushion cam meets elastomer roller assembly while freely pivoting clockwise. This unimpeded movement results in improved vertical link and triangular plate upward rotation greatly improving the operation and reliability of the rake trip mechanism to begin the pinsetter cycle. Minimal maintenance and lubrication are required to maintain the integrity of the PIT CUSHION CAM AND ROLLER KIT's components.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING:

“Not Applicable”

## DETAILED DESCRIPTION OF THE INVENTION:

Components of the Follower Link Assembly that attaches to each side of the pit cushion, includes two pivot links (described in Background of Invention), one ½ inch bolt, two 3/8 inch bolts, two urethane link rollers, three steel spacers, two bronze oilite spacer bushings, five ½ inch washers, two 3/8 inch washers, one ½ inch cap nut, two 3/8 inch cap nuts, and two 3/8 inch inside diameter by 1 3/4 inch outside diameter washers.

The PIT CUSHION CAM AND ROLLER KIT replaces all components of the Follower Link Assembly and includes one elastomer roller assembly, two steel spacers, one 3/8 inch bolt, one ½ inch bolt, two half inch washers, three 3/8 inch washers, one ½ inch cap nut, one 3/8 inch cap nut, and one pit cushion cam.

The PIT CUSHION CAM AND ROLLER KIT replaces Brunswick Corporation and other manufacturer's Pit Cushion Follower Link Assemblies. The PIT CUSHION CAM AND ROLLER KIT's pit cushion cam attaches to lower end of the pit cushion support mount next to uniball that attaches to the vertical link by ½ inch bolt. Elastomer roller assembly is bolted to lower end of support arm. Pit cushion cam, being securely fastened to pit cushion mount, does not rotate. As the pit cushion cam meets the elastomer roller assembly, the elastomer roller assembly stops movement of the pit cushion to the rear. The pit cushion cam meets the elastomer roller assembly. The elastomer roller assembly rotates allowing the rake sweep board to lower to the lane surface as vertical links and triangular plates rotate allowing the pit cushion to rotate upward and clockwise. As the rake sweeps rearward, the elastomer roller

assembly continues to rotate allowing the pit cushion assembly to move unimpeded. As the pinsetter nears the completion of its cycle, the rake sweep board raises pushing the vertical links and triangular plates in a downward counter clockwise position causing the pit cushion to move downward and forward. With the PIT CUSHION CAM AND ROLLER KIT, pit cushion's forward movement is not restricted as it was with the Follower Link Assembly.